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Developing a multi-metric habitat index for wadeable streams in Illinois.

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(May 1, 2008 - April 30, 2009)

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and John Epifanio

Submitted to

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Annual Project Report 2009
Project: T-25-P-001

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15 June 2009

Dr. John Epifanio,
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Dr. Brian Anderson,
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PROJECT TITLE: Developing a multi-metric habitat index for wadeable streams in Illinois.

Summary:

This project was initiated to describe key aquatic habitat characteristics and their association to anthropogenic disturbance by developing a field based, rapid assessment method for qualitatively monitoring instream conditions using a multi-metric habitat index. We have developed and applied a method for rating disturbance in wadeable streams throughout Illinois and collected information on physical habitat at 474 sites statewide. Index development and outreach will be the focus of our efforts for the remainder of the project. Presentations at three scientific meetings (Midwest Fish & Wildlife 2008, Illinois American Fisheries Society 2009, Emiquon Science Symposium 2009) based on project information were given. A seven month no cost extension was requested and granted during this reporting period (APPENDIX A). This report summaries progress for the period beginning 1 May 2008 and ending 30 April 2009.

JOB 1. Sample metrics at chosen sample sites.

1.1 Investigate utility of using existing disturbance ratings developed by Smogor 2000.

Assessment of the Smogor (2000) ratings suggested that an alternative approach would better meet the needs of our study by removing factors that influence fish directly but may not alter the physical structure of the stream channel (e.g., sewage outflows or hazardous waste locations) and by localizing the landscape summaries to the sites. **This job has been completed.**

1.2 Develop alternative disturbance rating scheme if needed.

We have developed a disturbance rating based on arc (stream confluence to confluence) local watershed, upstream catchment, and riparian zone perturbations. We used five metrics to assess stream segment watersheds at the local and upstream catchment level (over 50,000 arcs state wide): 1. proportion of disturbed land in the upstream catchment, 2. maximum volume of impounded water in the upstream catchment, 3. proportion of strip-mined land in the local watershed, 4. proportion of undisturbed land in the local riparian zone (150 m buffer centered on the stream), and 5. density of road crossings in the local watershed. An equally weighted sum of the standardized values for each metric was used as an index of disturbance. This method was used to apply disturbance ratings to stream arcs throughout Illinois (Figure 1). **This job has been completed.**

1.3 Select sites with range of disturbance for sampling.

Potential sites were based on station codes developed by Illinois EPA and each was assigned the disturbance rating of their corresponding stream arc. Because they offer a broad and relatively detailed coverage of the state we used the fish IBI regions developed by Smogor (2000) as a starting point for site selection. We selected a minimum of 30 sites to visit from each Fish IBI region (10 least disturbed, 10 most disturbed and 10 moderately disturbed). Locations with existing biological or physical/chemical data were given priority over sites without associated historical data. **This job has been completed.**

JOB 2. Identify potential metrics.

2.1 Identify a list of candidate metrics by reviewing existing indices and the literature.
While reviewing the literature, it became apparent that several common methods of habitat characterization might be appropriate for use in this project. However, these methods required detailed physical measurements that did not allow for a rapid assessment method (e.g., point transect method) or they lost potentially important information by broadly summarizing throughout the reach (e.g., SHAP [IEPA 1994]). To address these issues we collected and summarized data from each site at two scales: (1) the entire reach, and (2) individual channel units (Table 1)**. This job has been completed.**

2.2 Develop sampling techniques for each candidate metric.
Sampling techniques were fine-tuned during the 2006 field season and procedures were developed to facilitate data collection. Characteristics for substrate type and instream cover were defined based on existing methods (IEPA 1994). Metrics and data sheets were finalized before the beginning of the field season in 2007 and used for the remainder of the project (Figures 2A & 2B)**. This job has been completed.**

2.3 Sample metrics at chosen sample sites.
During the 2008 field season we focused on areas of the state that have been under sampled and on least disturbed sites to ensure sufficient data for index development. We have sampled candidate metrics at 474 unique locations (Figure 3) during the three field seasons (71 in 2006, 233 sites in 2007, and 163 in 2008). In addition several sites were sampled multiple times to evaluate consistencies between crews and years. Each year water levels precluded some sites from being sampled either due to flooding or when they became pooled or dry by late summer. **This job has been completed.**

JOB 3. Determine Regions

3.1 Identify possible regionalization schemes (e.g., watersheds, natural divisions).
Regionalizations used in Illinois have been based on Natural Divisions (Schwegman 1973), Ecoregions (Woods et al. 2006) or some modification of these (Smogor 2000). We examined Fish IBI regions, Natural Divisions, and Freshwater Ecoregions (TNC) as possible regions for index development (Table 2). In addition, we have typed stream segments using a method developed by colleagues in Michigan (Brenden et al. [2006, 2008]). This method uses stream segments based on confluence to confluence reaches as the basic unit (1:100,000). Each stream segment has been attributed with information from GIS summaries of landcover, geology, and physiography of the watershed and stream network. Stream typing for this project is based on size (link number), underlying geology (bedrock), and local channel gradient (valley slope). We are currently investigating the use of these stream types for regionalizing our habitat index.

3.2 Identify degree to which metrics sampled at least-disturbed sites differ among regions.
We have begun to examine the relationships between sampled metrics, defined statewide regions (see above), and our statewide stream typing. These stream types have been defined as having similar physical characteristics, rather then being defined on spatial proximity. They are being used to examine relationships between sampled metrics at least-disturbed sites rather than using geographical regions. This work is ongoing.

3.3 Select final regions.

Final selection will be based on the outcome of our analysis in 3.2 above. Work on this job has been rescheduled as per the approved no-cost extension.

JOB 4. Select Final Metrics.

4.1 Select final metrics based on those that reflect levels of disturbance in each region.

We have reviewed over 250 potential metrics (Table 3) and their relationship with our statewide disturbance ratings. We are currently assessing the relationships between those that showed statewide signals and the potential regionalizations. Final metric selection for the habitat index will be based on the outcome of this analysis. This work is ongoing and has been rescheduled as per the approved no-cost extension.

JOB 5. Develop scoring criteria for each region.

5.1 Establish regional scoring criteria for each metric.

Establishment of scoring criteria requires the completion of 4.1 above. This work is ongoing and has been rescheduled as per the approved no-cost extension.

JOB 6. Prepare Final Report.

6.1 Prepare final report including a "how to" manual.

Work on this job has been rescheduled for June-December of 2009 as per the approved no-cost extension.

6.2 Conduct a training workshop.

Work on this job has been rescheduled for June-October of 2009 as per the approved no-cost extension.

Literature Cited

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Presentations Given during this reporting period:

Sass, L.L., A. M. Holtrop, L. Hinz, and J. Epifanio. 2009. Developing a multimetric habitat index for wadeable streams in Illinois. Emiquon Science 2009, Dickson Mounds Museum, Lewistown, Illinois (12 March).

Sass, L.L., A. M. Holtrop, L. Hinz, and J. Epifanio. 2009. Developing a multimetric habitat index for wadeable streams in Illinois. 47th Annual Meeting of the Illinois Chapter of the American Fisheries Society, Moline, Illinois (24 February).

Sass, L. L., A. M. Holtrop, L. Hinz, and J. Epifanio. 2008. Developing a multimetric habitat index for wadeable streams in Illinois. 69th Midwest Fish and Wildlife Conference, Madison, WI. (15-16 December).

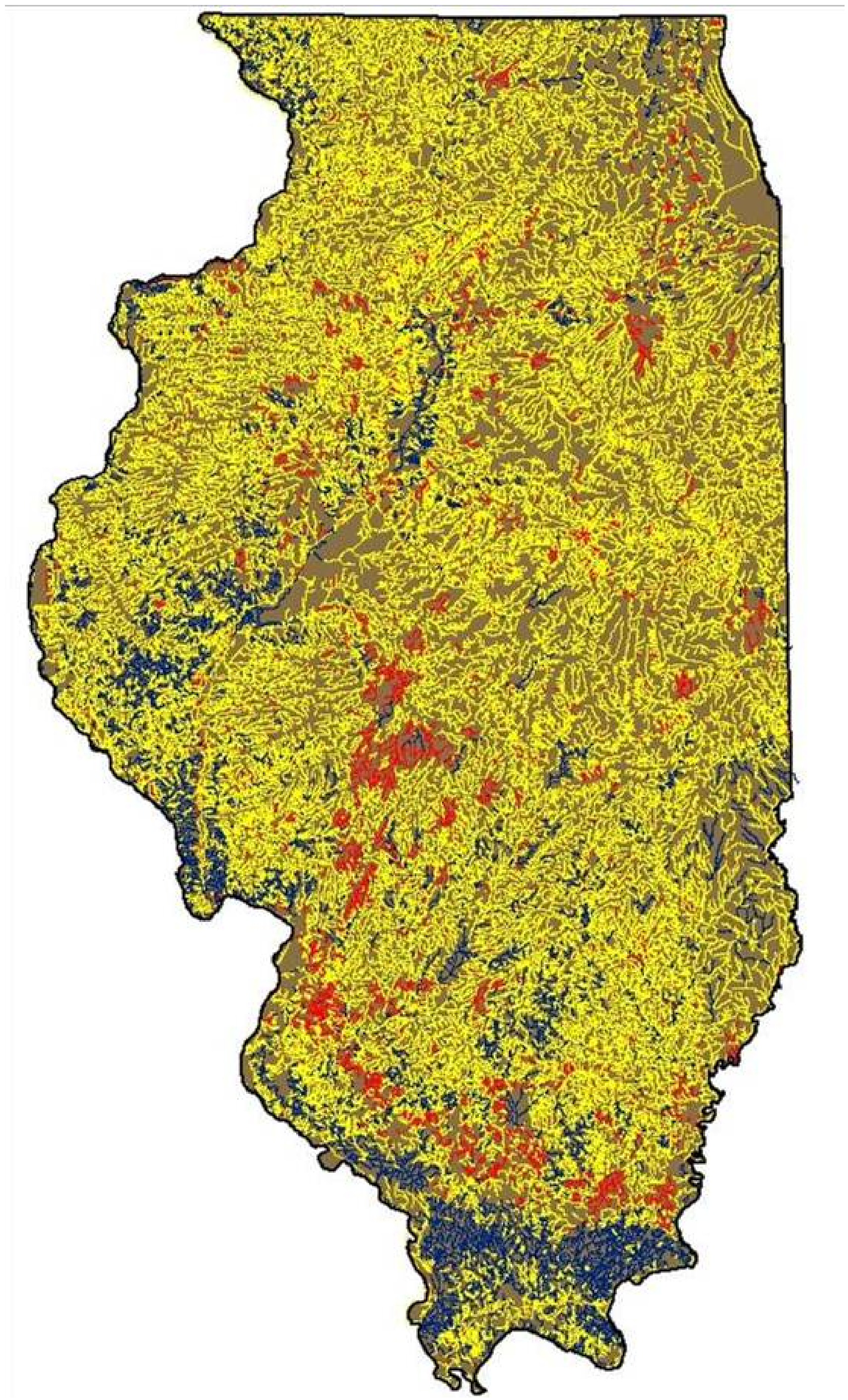


Figure 1. Disturbance ratings for Illinois streams (based on 1:100,000 NHD). Ratings were developed to reflect anthropogenic disturbance throughout the watershed and in riparian areas that could potentially affect stream habitat. Red streams are most disturbed, yellow streams are moderately disturbed, and blue streams are the least disturbed.

HABITAT EVALUATION FORM

Station Code: | Stream: | Location (include road crossing):

Date: | Scorer(s): | Gaz pg:

REACH CHARACTERISTICS Page __1__ of _____

Check one box per bank. River right looking upstream.

Buffer Width **(Top of Bank)**

L R (Per Bank)

- ☐ ☐ Very Wide > 100m
- ☐ ☐ Wide 50-100m
- ☐ ☐ Moderate 10-50m
- ☐ ☐ Narrow 5-10m
- ☐ ☐ Very narrow 1-5m
- ☐ ☐ None <1m (if checked, list land use adjacent to stream)

L _______________

R _______________

Riparian Type

L R (Predominant Per Bank)

- ☐ ☐ Trees
- ☐ ☐ Woody/Shrub
- ☐ ☐ Herbaceous
- ☐ ☐ Mixed

Stream Bank Vegetation

1=Sparse, 2=Intermediate, 3=Abundant

Left	Vegetation	Right
0 1 2 3	Herbaceous	0 1 2 3
0 1 2 3	Woody/Shrub	0 1 2 3
0 1 2 3	Trees	0 1 2 3
0 1 2 3	Bare	0 1 2 3
0 1 2 3	Bedrock	0 1 2 3

Predominant Channel Type

Pool

Riffle

Run

Total # of Channel Units: ______

Predominant Substrate in Reach

(1=Predominant, 2=Next Dominant)

- ☐ Boulder (>256 mm)
- ☐ Slab Boulder (>256 mm)
- ☐ Cobble (64-256 mm)
- ☐ Gravel (8-64mm)
- ☐ Fine Gravel (2-8 mm)
- ☐ Sand
- ☐ Hardpan
- ☐ Silt
- ☐ Bedrock

Predominant Flow in Reach

Check one

- ☐ Fast
- ☐ Moderate
- ☐ Slow
- ☐ No detectable flow

Shading of Water Surface

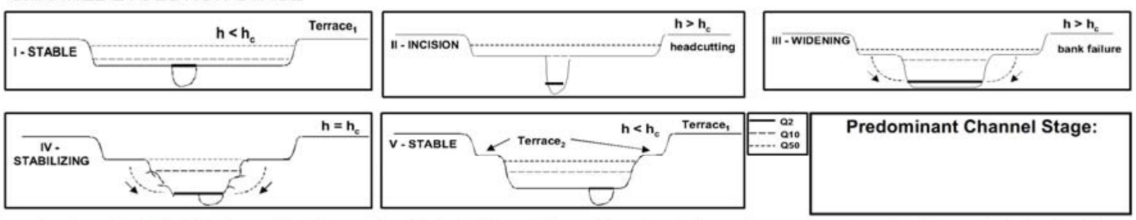
- ☐ Water surface completely shaded
- ☐ Water mostly shaded with some sunlight
- ☐ Half water surface shaded, half full sunlight
- ☐ Most water surface receiving sunlight
- ☐ Lack of canopy; full sunlight reaching water

Thalweg Depths in Reach

1 __________ m
2 __________ m
3 __________ m
4 __________ m
5 __________ m
6 __________ m
7 __________ m
8 __________ m
9 __________ m
10 __________ m

Comments:

CHANNEL EVOLUTION STAGE



Predominant Channel Stage:

h=streambank height; hc = critical streambank height (slope failure is imminent depending on the strength of the soils in the bank)

ADDITIONAL STREAM INFORMATION

Water Level

- ☐ Rising
- ☐ Normal/Base Flow
- ☐ Decreasing
- ☐ Pooled

Stream Modifications

Check all that apply

- ☐ Outfalls/pipes
- ☐ Canopy Removal
- ☐ Dredging
- ☐ Artificial cover/substrate
- ☐ Impoundments
- ☐ Leveed
- ☐ BMPs (List practices)
- ☐ Channelized

	Wetted Width	Thalweg Depth
DS	m	m
MID	m	m
UP	m	m
Mean	m	m

Reach Length:_____________m

GPS Location (NAD83)

Latitude: __________

Longitude: __________

Photos Taken: ☐ Yes # Taken______ ☐ No

Comments: Reach starts ____m upstream/downstream from bridge.

Figure 2A. Example field sheets including information collected at each site (reach scale).

Station Code: Date: Scorer(s): Page _____ of _____

Unit #:_________ **CHANNEL UNIT (Circle One):** **Lateral Pool** **Mid-Channel Pool** **Riffle** **Run** **Transitional**

Substrate Type (1=Predominant, 2=Next Dominant)

- [ ] Boulder (>256 mm)
- [ ] Slab Boulder (>256 mm)
- [ ] Cobble (64-256 mm)
- [ ] Gravel (8-64mm)
- [ ] Fine Gravel (2-8 mm)
- [ ] Sand
- [ ] Hardpan
- [ ] Silt
- [ ] Bedrock

Cover (0=None, 1=Sparce, 2=Intermediate, 3=Abundant)

0 1 2 3 Undercut Bank
0 1 2 3 Overhanging Vegetation
0 1 2 3 Rootwads
0 1 2 3 Boulder
0 1 2 3 Aquatic Macrophytes
0 1 2 3 Logs or Woody Debris
0 1 2 3 Aggregate LWD
0 1 2 3 Rootmats
0 1 2 3 Other____________

Substrate Embeddedness (1°substrate)
Applies when 1°substrate is ≥fine gravel

- [ ] Not Embedded
- [ ] 0-25% Embedded
- [ ] 25-50% Embedded
- [ ] 50-75% Embedded
- [ ] 75-100% Embedded
- [ ] Pool (N/A)
- [ ] 1°substrate is fine (N/A)

Depth of Fines as Bottom Cover

- [ ] None
- [ ] 1-25 mm
- [ ] 25-50 mm
- [ ] 50-75 mm
- [ ] > 75 mm

Cross Section Depths
(Pools Only) Measure from LAB to RAB

1 _____ m
2 _____ m
3 _____ m
4 _____ m
5 _____ m
6 _____ m
7 _____ m
8 _____ m

Max Depth: _______ m

Predominant Flow
(Circle One)
Fast
Moderate
Slow
No Detectable Flow

Comments:

Unit #:_________ **CHANNEL UNIT (Circle One):** **Lateral Pool** **Mid-Channel Pool** **Riffle** **Run** **Transitional**

Substrate Type (1=Predominant, 2=Next Dominant)

- [ ] Boulder (>256 mm)
- [ ] Slab Boulder (>256 mm)
- [ ] Cobble (64-256 mm)
- [ ] Gravel (8-64mm)
- [ ] Fine Gravel (2-8 mm)
- [ ] Sand
- [ ] Hardpan
- [ ] Silt
- [ ] Bedrock

Cover (0=None, 1=Sparce, 2=Intermediate, 3=Abundant)

0 1 2 3 Undercut Bank
0 1 2 3 Overhanging Vegetation
0 1 2 3 Rootwads
0 1 2 3 Boulder
0 1 2 3 Aquatic Macrophytes
0 1 2 3 Logs or Woody Debris
0 1 2 3 Aggregate LWD
0 1 2 3 Rootmats
0 1 2 3 Other____________

Substrate Embeddedness (1°substrate)
Applies when 1°substrate is ≥fine gravel

- [ ] Not Embedded
- [ ] 0-25% Embedded
- [ ] 25-50% Embedded
- [ ] 50-75% Embedded
- [ ] 75-100% Embedded
- [ ] Pool (N/A)
- [ ] 1°substrate is fine (N/A)

Depth of Fines as Bottom Cover

- [ ] None
- [ ] 1-25 mm
- [ ] 25-50 mm
- [ ] 50-75 mm
- [ ] > 75 mm

Cross Section Depths
(Pools Only) Measure from LAB to RAB

1 _____ m
2 _____ m
3 _____ m
4 _____ m
5 _____ m
6 _____ m
7 _____ m
8 _____ m

Max Depth: _______ m

Predominant Flow
(Circle One)
Fast
Moderate
Slow
No Detectable Flow

Comments:

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- [ ] Bedrock

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0 1 2 3 Aggregate LWD
0 1 2 3 Rootmats
0 1 2 3 Other____________

Substrate Embeddedness (1°substrate)
Applies when 1°substrate is ≥fine gravel

- [ ] Not Embedded
- [ ] 0-25% Embedded
- [ ] 25-50% Embedded
- [ ] 50-75% Embedded
- [ ] 75-100% Embedded
- [ ] Pool (N/A)
- [ ] 1°substrate is fine (N/A)

Depth of Fines as Bottom Cover

- [ ] None
- [ ] 1-25 mm
- [ ] 25-50 mm
- [ ] 50-75 mm
- [ ] > 75 mm

Cross Section Depths
(Pools Only) Measure from LAB to RAB

1 _____ m
2 _____ m
3 _____ m
4 _____ m
5 _____ m
6 _____ m
7 _____ m
8 _____ m

Max Depth: _______ m

Predominant Flow
(Circle One)
Fast
Moderate
Slow
No Detectable Flow

Comments:

Figure 2B. Example field sheets including information collected at each site (unit scale).

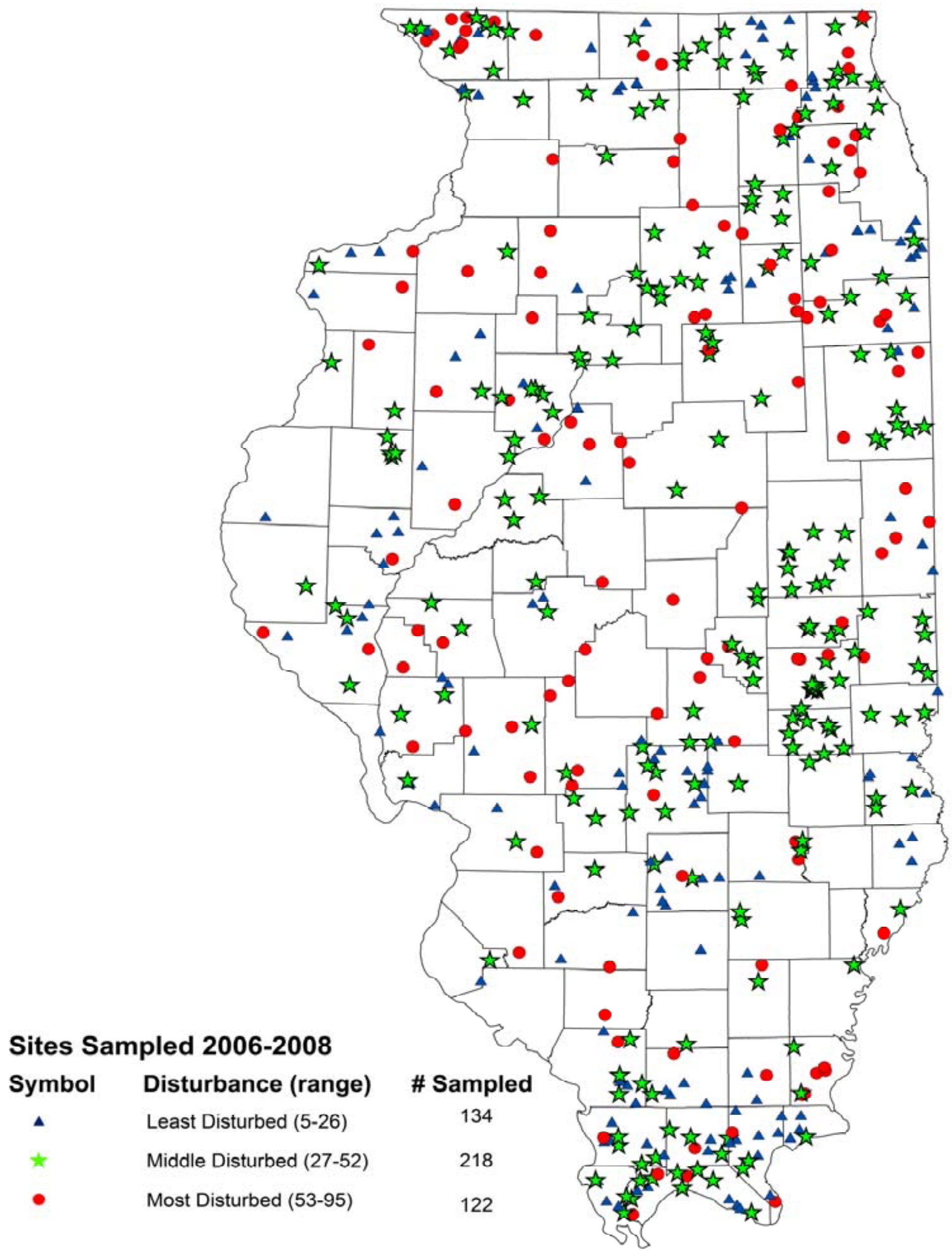

Figure 3. Location of sites at which candidate metrics were sampled between 2006-2008. Sites are coded according to the respective disturbance level (red circles are most disturbed, green stars are moderately disturbed, and blue triangles are least disturbed sites).

Table 1. Candidate metrics collected by field staff. Scale refers to whether the metric is determined for each channel unit, for the entire sampling reach, or both.

Metric	Definition	Scale
Buffer Width	Width of the undeveloped buffer on each side of the stream	Reach
Riparian Type	Type of vegetation growing in the buffer zone	Reach
Stream Bank Vegetation	Type of vegetation growing on the stream banks	Reach
Predominant Channel Type	Pool, riffle, or run	Reach
Predominant Substrate	Most abundant type of substrate	Both
Predominant Flow	Fast, moderate, slow, or no detectable flow	Both
Shading of Water Surface	Completely, mostly, half, most light, all light	Reach
Thalweg Depths	10 approximately equidistant depths taken	Reach
Channel Evolution	Per Schumm et al. 1984	Reach
Water Level	Rising, base flow, decreasing or pooled	Reach
Stream Modifications	Any human alterations are noted	Reach
Wetted Width	Taken at the downstream, mid and upstream points	Reach
Thalweg Depth	Taken at the downstream, mid and upstream points	Reach
Channel Unit Type	Lateral pool, mid-channel pool, riffle, run or transitional	Unit
Cover	Abundance of cover for 9 types (see Figure 2b)	Unit
Substrate embeddedness	Only applied to substrates fine gravel and larger	Unit
Depth of fines as bottom cover	None, 1-25mm, 25-50, 50-75, and >75mm	Unit
Cross section depths	Eight depths are taken across pools	Unit
Max depth	Deepest water in a unit	Unit

Table 2. Total number of sites sampled within potential regionalizations by disturbance class.

Fish IBI Region	Disturbance Class Least	Middle	Most	Total
1	6	9	8	23
2	10	17	10	37
3	10	12	10	32
4	9	15	10	34
5	7	15	11	33
6	6	32	10	48
7	11	19	13	43
8	11	12	11	34
9	12	23	8	43
10	12	9	12	33
11	11	26	9	46
12	18	16	6	40
13	11	13	4	28

Natural Division	Disturbance Class Least	Middle	Most	Total
Coastal Plain	13	18	7	38
Grand Prairie	13	75	47	135
Illinois River/ Miss R. Sand Areas	2	1	0	3
Lower Mississippi R. Bottomlands	5	3	1	9
Middle Mississippi R. Border	1	3	2	6
Northeastern Morainal	20	23	13	56
Rock River Hill Country	5	5	2	12
Shawnee Hills	9	3	0	12
Southern Till Plain	28	34	14	76
Upper Miss./ Illinois R Bottomlands	11	18	10	39
Wabash River Border	12	17	13	42
Western Forest-Prairie	10	15	8	33
Wisconsin Driftless	5	3	5	13

Freshwater Ecoregion	Disturbance Class Least	Middle	Most	Total
Laurentian Great Lakes	0	0	1	1
Lower Mississippi	13	14	4	31
Teays – Old Ohio	26	57	22	105
Upper Mississippi	95	147	95	337
Total Sampled	134	218	122	474

Table 3. Candidate metrics examined for statewide signals related to androgenic disturbance. Metrics in **bold** show the best relationships and are being further examined within the potential regionalization methods.

Substrate Type

Proportion Of Clay
Proportion Of Silt
Proportion Of Sand
Proportion Of Fine Gravel
Proportion Of Gravel
Proportion Of Gravels
Proportion Of Cobble
Proportion Of Slab Boulder
Proportion Of Boulder
Proportion Of Boulder-Cobble Substrate
Proportion Of Hardpan
Proportion Of Bedrock
Predominant Substrate In The Units
Predominant Substrate For The Reach
Substrate Calculated With QHEI Methods
Predominant Substrate QHEI
Next Predominant Substrate QHEI
Predominant Substrate For Predominant Unit Type

Substrate Quality

Substrate Class
Proportion Soft Substrate
Proportion Coarse Substrate
Deepest Fine
Deepest Fine In The Runs
Deepest Fine In The Riffles
Deepest Fine In The Pools
Proportion Of Pools With Predominant Silt
Proportion Of All Pools
Proportion Of Units With Predominant Silt
Number Of Units That Are Not Embedded
Proportion Of Units Not Embedded
Proportion Of Units With Macrophytes
Average Of Deepest Fines
Average Of Embeddedness
Average Of Percent Embeddedness
Substrate Stability
Predominant Substrate Size
Next Predominant Substrate Size
Average Of Predominant Substrate Size
Average Of Next Predominant Substrate Size
Average Substrate Size
Proportion Of Boulder-Cobble-Gravel

Instream Cover Type

Number Cover Types Reach
Number Cover Types Runs
Number Cover Types Pools
Proportion Of Units With "Other"
Proportion Of Junk
Proportion Of Undercut Banks
Proportion Of Overhanging Cover
Proportion Of Rootwad
Proportion Of Boulder
Proportion Of Large Woody Debris
Proportion Of Rootmat
Proportion Of Overhang-Rootmats
Proportion Of Wood
Proportion Of Under Cut-Over Hanging
Proportion Of Aquatic Macrophyte Cover
Number Pools>70 Cm Deep
Number Pools>50 Cm Deep
Proportion Of Pools>70 Cm Deep
Proportion Of Pools>50 Cm Deep
Number Runs>70 Cm Deep
Number Runs>50 Cm Deep
Proportion Of Runs>70 Cm Deep
Proportion Of Runs>50 Cm Deep
Number Units>70 Cm Deep
Number Units>50 Cm Deep
Proportion Of Units>70 Cm Deep
Proportion Of Units>50 Cm Deep

Instream Cover Amount

Proportion Of Units With No Cover
Proportion Of Units With Some Cover
Proportion Of 0s For Cover
Proportion Of 1s For Cover
Proportion Of 2s For Cover
Proportion Of 3s For Cover
Proportion Of Overhang-Rootmat In Pools
Proportion Of Wood In Pools
Proportion Of Overhang-Rootmat In Runs
Proportion Of Wood In Runs
Proportion Of Overhang-Rootmats In Riffles
Proportion Of Wood In Riffles
Proportion Of Total Cover
Count Of Cover Types
Cover Calculated Similarly To QHEI

Table 3. Continued

Pool/Riffle Quality

Proportion Of Riffles
Proportion Of Riffles>10 Cm Deep
Number Lateral Pools
Number Mid-Channel Pools
Total Number Of Pools
Total Number Of Riffles
Pool Max Depth To Mean Depth Ratio
Pool Min Depth To Mean Depth Ratio
Pool Mean Depth Mean Depth Ratio
Variance Max Pool Depth
Variance In Mean Pool Depth
Count Units That Are Not Pools
Proportion Of Units That Are Pools
Proportion Of Units That Are Mid-Channel Pools
Proportion Of Units That Are Lateral Pools
Pool Variability Score
Mean Range Of Pool Cross Sections
Average Of The Max Depth In Riffles
Proportion Riffles With Coarse Substrate
Number Of Riffles With Embeddedness
Proportion Of Riffles With Embeddedness
Variation In Riffle Substrate
Pool To Riffle Ratio
Pool Substrate Characterization
Average Of Pool Depth Variance
Pool Quality Score
Deepest Fines Depth In Pools
Max Of Max Depth Across Pools
Proportion Of Pools >70 Cm Deep
Proportion Of Pools >50 Cm Deep
Deepest Fines In Pools
Average Fines In Pools
Average Substrate Size In Pools
Proportion Of Cover In Pools

Misc. Data

Flood Plain Quality
Air Temp
Water Temp
Hydro Diversity

Riparian Quality /Erosion

Minimum Buffer Width
Maximum Buffer Width
Average Buffer Width
Buffer Riparian Score
Adjacent Land Use
Bank Erosion
Bank Stability
Cover Structure
Average Riparian Type
Bank Erosion Ranked
Bank Stability Ranked
Riparian Similar To QHEI
Average Buffer Width Ranked

Channel Quality/Stability

Channel Evolution
Channel Evolution Class
Width To Depth Ratio
Shading
Percent Shade*
Sinuosity
Channelized (Yes/No)
Stream Modifications
Channel Alteration

Other Units

Number Of Lateral Pools
Number Of Mid-Channel Pools
Number Of Pools
Number Of Runs
Number Of Riffles
Number Of Transitional Units
Proportion Of Lateral Pools
Proportion Of Mid-Channel Pools
Proportion Of Pools
Proportion Of Runs
Proportion Of Riffles
Proportion Of Transitional Units
Number Unit Types
Most Common Unit
Total Number Of Units
Predominant Channel Type
Max Of Max Depth Unit

Table 3. Continued

Thalweg

Thalweg Minimum Depth
Thalweg Maximum Depth
Thalweg Mean Depth
Thalweg Max Depth To Min Depth Ratio
Thalweg Mean Depth To Max Depth Ratio
Thalweg Range Of Depths
Thalweg Variance Across Depths
Variance Of Max Depth In Runs
Thalweg Max To Mean Depth Ratio In Runs

Flow

Predominant Flow In The Reach
Predominant Flow In The Units
Proportion Of No Flow Units
Proportion Of Slow Flow Units
Proportion Of Moderate Flow Units
Proportion Of Fast Flow Units
Number Flow Types
Proportion Of Slow & No-F Low Units
Proportion Of Moderate & Fast Flow Units
Ratio Of Slow To Fast Flow Units
Mean Velocity
Water Level

APPENDIX A.

U of I Grant Code: D8199 / 1-597098-375007-191100

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Institute of Natural Resource Sustainability
Illinois Natural History Survey

1816 South Oak Street
Champaign, Illinois 61820

November 26, 2008

Ann Holtrop
Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702-1271

Dear Ms. Holtrop:

This letter is a request for an extension of time, without supplemental funds, for completion of the Grant between the Illinois Department of Natural Resources and the University of Illinois for Developing a multi-metric habitat index for wadeable streams in Illinois, (T-25-P-001). A seven month extension of time is requested, which will result in December 31, 2009 as the new date for project completion.

A new schedule is necessary because fiscal obligations required that we execute this grant approximately four months earlier than full time staff were available to begin work. In addition we have experienced two extreme weather years (dry in 2006 and wet in 2007) limiting our access to field sites. Generally, water levels in Illinois do not reach base flow until early June. Therefore, effective training of interested user groups (Job 6) would also best be conducted in the summer (June-October). An extension will allow us to conduct field training in the appropriate season and revise the field manual after additional input from the field staff.

Please contact me if additional information is required. To indicate your approval of this request, please sign in the indicated space below, acquire additional approvals necessary within your agency (if any), and please return the approved request to Sandra Moulton, Associate Director, Post Award Administration, University of Illinois, 1901 South First Street, Suite A; Champaign, IL 61820.

Sincerely,

John Epifanio
Principal Investigator

Approved:

Ann Holtrop, Project Manager Illinois Department of Natural Resources	Kay L. Williams, Director PostAwards, Grants & Contracts Office University of Illinois
Michael E. Douglas, Division Director Illinois Natural History Survey	Brian Anderson, Director Illinois Natural History Survey